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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,854	04/09/2004	Yu-Wen Chen	CHEN3655/EM	8688
23364	7590	04/06/2005	EXAMINER	
BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314			SANDVIK, BENJAMIN P	
			ART UNIT	PAPER NUMBER
			2826	

DATE MAILED: 04/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/820,854	CHEN ET AL.	
	Examiner	Art Unit	
	Ben P. Sandvik	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Claim Objections

Claims 19 and 20 are objected to because of the following informalities: the claimed subject matter of claims 19 and 20 is identical to the claimed subject matter of claims 12 and 13, respectively. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 17, 18, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mertol (U.S. Patent #5909056), in view of Ku et al (U.S. PG Pub #20030001252).

With respect to claims **1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 17, 18, and 21** Mertol teaches:

an upper chip (Fig. 2, 211) having a first active surface and a first back surface wherein the upper chip is flipped over and attached to the upper surface of the substrate via a plurality of first electrically conductive bumps (Fig. 2, 209),
a ring-like dam disposed on the upper surface of a substrate (Fig. 2, 203),

a heat spreader attached to the first back surface of a chip and attached to the dam (Fig. 2, 200),

an adhesive layer interposed between the heat spreader and the first back surface of an upper chip being a thermally conductive epoxy (Fig. 3, 302),

an encapsulation filled in a space enclosed by a heat spreader, an upper surface of a substrate, and a dam (Fig. 2, 210)

an encapsulation comprising an underfill (Fig. 2, 209),

an underfill connected to the upper surface of the substrate, the heat spreader, and the dam (Fig. 2, 210),

a heat spreader that is a flat plate (Fig. 2, 200),

a plurality of solder balls formed on the lower surface of the substrate (Fig. 2, 207),

and a dam formed in a bar-like shape (Fig. 2, 203).

Mertol does not teach an opening passing through the upper surface and lower surface, a lower chip accommodated in the opening and electrically connected to the first active surface of the upper chip through a plurality of second electrically conductive bumps, the lower chip is exposed from out of the underfill, or that the upper chip is larger than the lower chip in size. Ku teaches an opening passing through the upper surface and lower surface (Fig. 3a, 12), a lower chip (Fig. 3a, 2) accommodated in the opening and electrically connected to the first active surface of the upper chip through a plurality of second electrically conductive

bumps (Fig. 3a, 6), that the lower chip is exposed from out of the underfill (Fig. 3a, 2b), and that the upper chip (Fig. 3a, 4) is larger than the lower chip (Fig. 3a, 2) in size. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the device of Mertol with an opening passing through the substrate and a lower chip accommodated in the opening and electrically connected to the first active surface of the upper chip through a plurality of second electrically conductive bumps, and also to have the lower chip exposed from out of the underfill, in order to expand the functionality of the resulting package while retaining the slim profile of a single chip package, and improve the thermal dissipating characteristics of the package, respectively.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ku and Mertol, further in view of Miyazaki (U.S. PG Pub #20020008316).

With respect to **claim 10**, Ku and Mertol teach all of the limitations of claim 1, but do not teach that the heat spreader comprising copper. Miyazaki teaches a heat spreader comprising copper (Paragraph 9). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ku, Mertol, and Miyazaki to make a heat spreader comprising copper because copper has desirable heat transferring characteristics.

With respect to **claim 11**, Ku and Mertol teach all of the limitations of claim 1, but do not teach that the heat spreader comprising aluminum. Miyazaki teaches a heat spreader comprising aluminum (Paragraph 9). It would have

been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ku, Mertol, and Miyazaki to make a heat spreader comprising aluminum because aluminum has desirable heat transferring characteristics.

Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ku and Mertol, further in view of Glenn (U.S. Patent #6092281).

With respect to **claim 14**, Ku and Mertol teach all of the limitations of claim 1, but do not teach that the dam is an adhesive body. Glenn teaches that the dam is an adhesive body (Col 3 Ln 50). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ku, Mertol, and Glenn to make the dam an adhesive body in order to enhance the structural integrity of the package.

With respect to **claim 15**, Ku and Mertol teach all of the limitations of claim 1, but do not teach that the dam comprises epoxy. Glenn teaches that the dam comprises epoxy (Col 3 Ln 50). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ku, Mertol, and Glenn to make the dam an adhesive body in order to enhance the structural integrity of the package.

With respect to **claim 16**, Ku and Mertol teach all of the limitations of claim 1, but do not teach that the dam comprises thermally conductive epoxy. Glenn teaches that the dam comprises thermally conductive epoxy (Col 3 Ln 50). It

would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ku, Mertol, and Glenn to make the dam comprise thermally conductive epoxy in order to enhance the thermal dissipation of the package.

Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mertol, in view of McCormick (U.S. Patent #6369448).

With respect to **claims 22 and 23**, McCormick teaches a multi-chip package comprising:

- a substrate having an upper surface and a lower surface (Fig. 4, 402),

- an upper chip (Fig. 4, 410) having a first active surface and a first back surface wherein the upper chip is flipped over and attached to the upper surface of the substrate via a plurality of first electrically conductive bumps (Fig. 4, 414),

- a lower chip (Fig. 4, 412) disposed above the upper surface and electrically connected to the first active surface of the upper chip through a plurality of second electrically conductive bumps (Fig. 4, 422),

- an underfill enclosing the upper chip, the lower chip, the first electrically conductive bumps and the second electrically conductive bumps, and covering the upper surface of the substrate (Fig. 4, 418),

that the first electrically conductive bump (Fig. 4, 414) is larger than the second electrically conductive bump (Fig. 4, 422) in height,

but McCormick does not teach a dam disposed at the periphery of the upper surface of the substrate or a heat spreader attached to the first back surface of the upper chip and attached to the dam. Mertol teaches a dam disposed on the upper surface of a substrate (Fig. 2, 203), and a heat spreader attached to the first back surface of a chip and attached to the dam (Fig. 2, 200). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of McCormick and Mertol to place a dam in order to prevent an encapsulant from spilling during the manufacturing process, to use a heat spreader in order to improve the thermal dissipation capabilities of the package using the heat spreader, and to make the first electrically conductive bump larger than the second electrically conductive bump in order to maintain a slim profile for the package.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben P. Sandvik whose telephone number is (571) 272-8446. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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